

GEMMASTA

GFE3

**ELEMENTARY
FACETING
INSTRUCTIONS**

FIRST EDITION

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 ILLUSTRATIONS BY HITEK ILLUSTRATIONS

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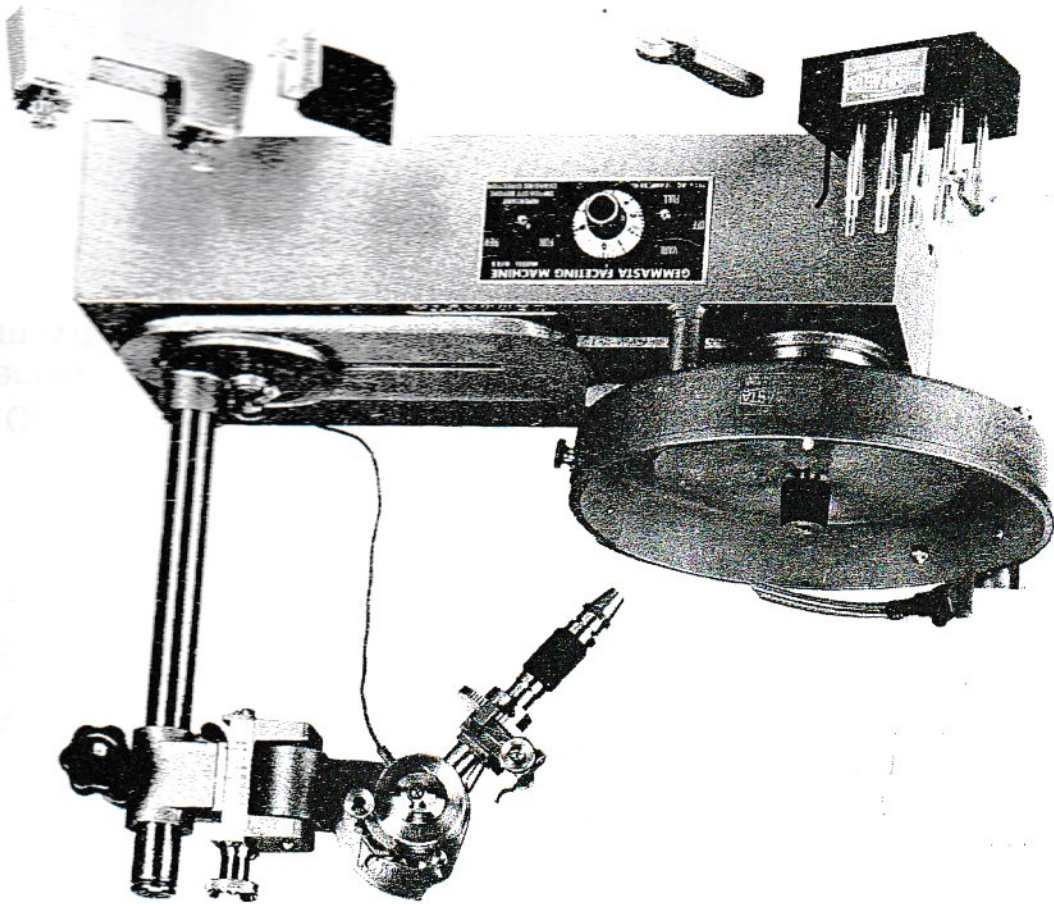
INTRODUCTION

On being requested to write this book for Gemmasta Lapidary Equipment Company the proprietor of Gemmasta, as it is more commonly referred to, placed no restrictions on the author. To receive an open hand was indeed appreciated. In articles I have written for magazines and in talks I have given I have 'kept it simple' as I believe that to simplify an instruction allows the learner to grasp the basics of the knowledge from which he can more easily understand the more detailed parts of the subject. To simplify the manufacture of a piece of equipment not only makes it easier to understand the functions of that item it also allows the manufacturer to build a rugged piece of machinery that will withstand continued use and repeatable accuracy with normal maintenance.

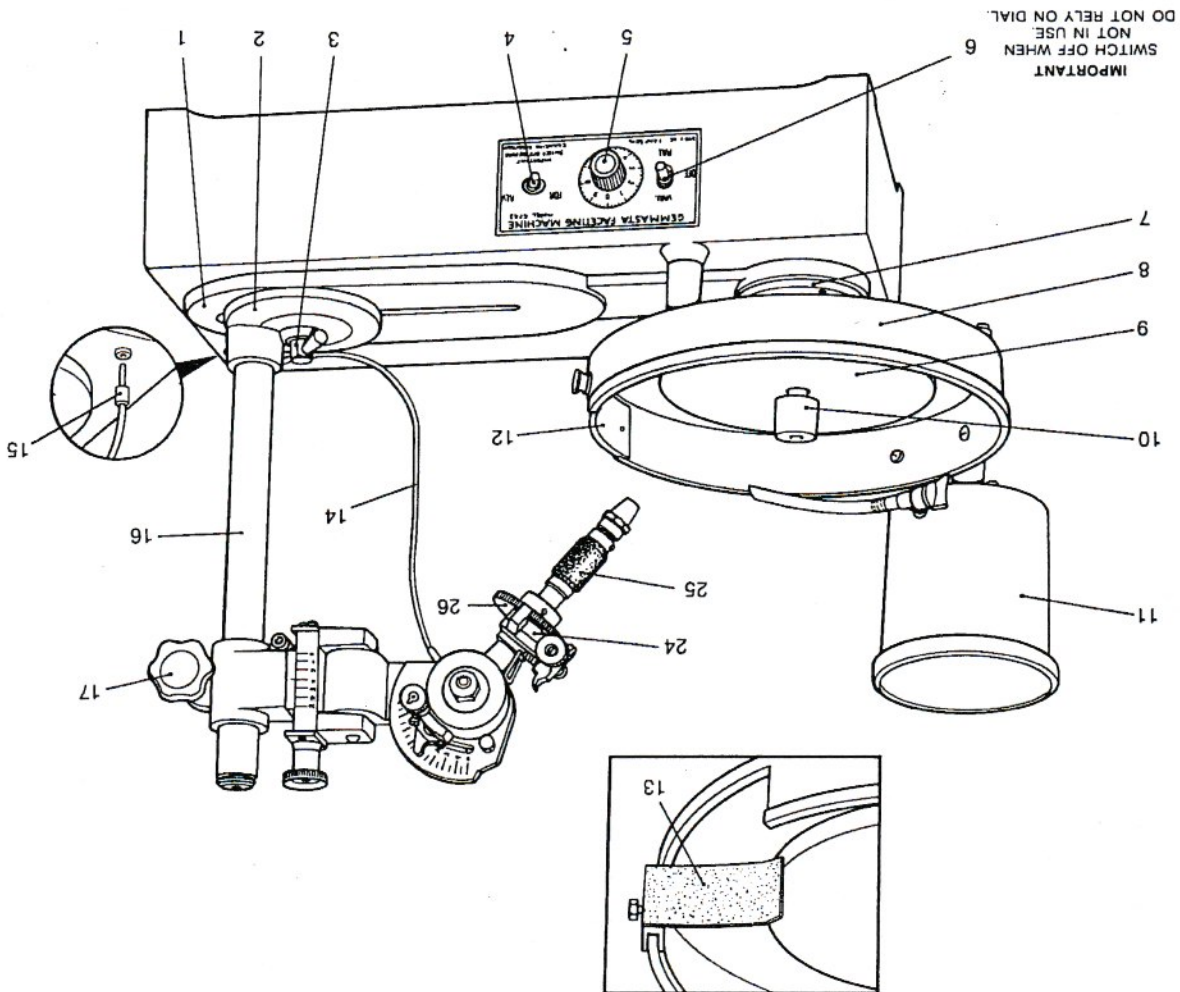
I have been the owner of a Gemmasta Faceting machine for some years and have since added additional accessories. The machine has required no major adjustments since new as they are maintained on a regular basis. More on that later.

It is not the object of the author to write a book on Gemmology, that is more than adequately covered by more experienced authors. It is recommended that as your interest grows in faceting you give serious consideration to reading some text books on Practical Gemmology to further your understanding of minerals. An approach to an established supply house will be rewarded with sound recommendations.

My thanks must go to the numerous known and unknown faceters of many years standing who have given freely of their time and knowledge to write articles for lapidary journals and club newsletters, it is these faceters who generate and keep alive this interesting and rewarding hobby.

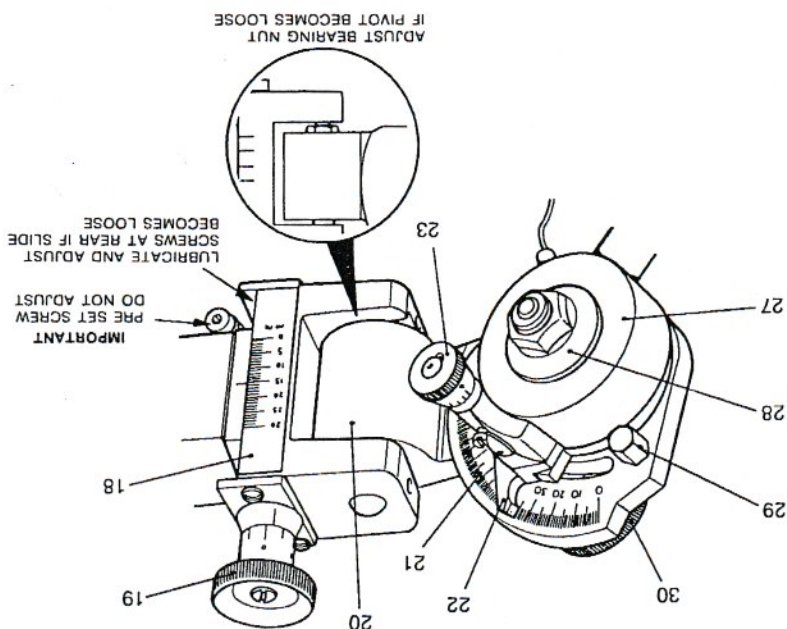
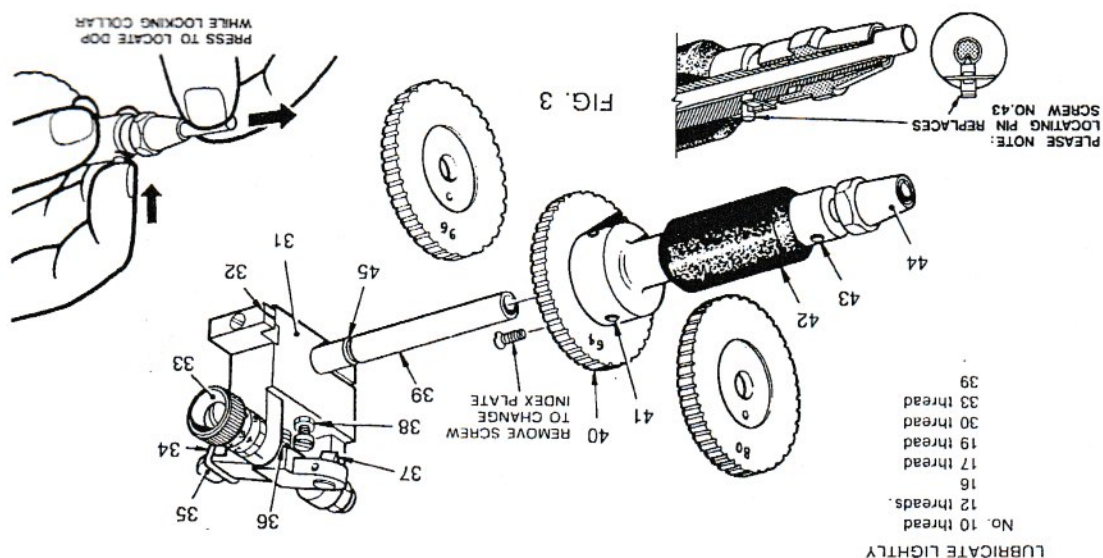


MODEL GFE 3 **THE GEMMASTA FACETING MACHINE** Approx. Weight Less Motor, 36 lbs. (16 kg.)



NO.	DESCRIPTION	NO.	DESCRIPTION
1.	STURDY ALLOY BASE (KEEP MACHINED SURFACE CLEAN).	14.	BUZZER CORD.
2.	SLIDING POST BASE.	15.	BUZZER CONNECTOR.
3.	POST BASE LEVER.	16.	1" POST.
4.	FORWARD/REVERSE SWITCH.	17.	COURSE HEIGHT ADJUSTMENT KNOB.
5.	VARI SPEED CONTROL DIAL.	18.	FINE HEIGHT SCALE (GRADUATED IN mm).
6.	VARI-OFF-FULL SPEED SWITCH.	19.	FINE HEIGHT ADJUSTMENT KNOB (GRADUATED IN 1/10mm).
7.	BEARING HOUSING (SEALED BALL RACES).	20.	HORIZONTAL PIVOT FOR DOP ARM (ADJUSTMENT FIG. 2).
8.	SPLASH PAN, ALLOY CASTING.	21.	PROTRACTOR (GRADUATED IN DEGREES).
9.	MASTER LAP.	22.	ANGLE POINTER (CAN BE SET FOR ANY ANGLE).
10.	LAP HOLDING DOWN SCREW (LEFT HAND).	23.	ANGLE VERNIER THIMBLE (GRADUATED IN 1/10 DEG.).
11.	COOLANT DRIP TANK (REMOVABLE WITH LOCKING SCREW).	24.	RADIAL VERNIER (CHEATER) ASSEMBLY SEE FIG. 3.
12.	REMOVABLE GATE FOR HORIZONTAL OPERATION.	25.	FREE WHEEL KEYED HAND PIECE FOR GIRDLER PERFORMING
13.	SPLASH GUARD.		

NO	DESCRIPTION	NO.	DESCRIPTION
26	INDEXING PLATE	36	TRIGGER SPRING
27	VERTICAL PIVOT FOR DOP ARM	37	ENGAGING TOOTH FOR INDEXING
28	SELF LOCKING NUT (ADJUSTABLE FOR LIGHT OR HEAVY GEMSTONES)	38	TRIGGER STOP
29	VERTICAL STOP	39	DOP ARM SPINDLE
30	LOCKING NUT FOR PROTRACTOR	40	INDEX PLATE (64 SUPPLIED, 96 AND 80 AVAILABLE)
31	RADIAL VERNIER BLOCK	41	3 SPRING LOADED BALLS TO LOCATE IN NO. 41
32	MARK FOR LINING UP RADIAL VERNIER (ALWAYS START WITH TRIGGER IN CENTRE AND VERNIER ADJUSTER SET AT ZERO)	42	HAND PIECE REMOVABLE FOR INSPECTION OF GEM- STONES AND TO CHANGE INDEX PLATE
33	VERNIER ADJUSTING SCREW (GRADUATED IN 1/10 mm)	43	POINTED LOCATING SCREW FOR KEVED DOPSTICKS
34	LEVER TO LOCKOUT TRIGGER FOR PREFORMING	44	SELF CENTERING PIN (LOCKED WITH SPANNER SUPPLIED)
35	TRIGGER	45	GROOVE FOR BALL IN NO. 41



Your Gemmasta is the result of many years planning and development by practical qualified engineers with wide faceting experience. It has been designed by faceters for faceters.

Before purchasing this machine you

have no doubt been around and spoken to dealers, a friend who is a

faceter or your local lapidary club. People who have a wide variety of

machines and possibly some who own a Gemmasta.

The design of the Gemmasta

warrants some general comment to

acquaint you with its features. The

base of the machine is deep, this

makes it a rugged, stable machine,

there is no possibility of warpage of

the casting. Warpage of the casting

allows misalignment between the

master lap and the mast. Your

Gemmasta has been accurately

machined and aligned to ensure

constant lap alignment as moved

across the lap (lateral alignment) and

also longitudinal alignment (fore and

aft). This result has been achieved

through the base being machined in

one operation for the location of the

master lap bearing housing and the

mast base. There is no possibility of

either one being out of alignment

to the other.

This ensures that as you change

position of the mast from one position

on the base to another position in a

longitudinal movement there will be no

possibility of a change of angle of the

facet. A very important feature.

The machine is fitted with the

latest in speed control circuitry to

allow variation in lap speed for both

cutting and polishing. Accurate speed

control in the lower speed ranges is

important in polishing, especially in

the harder gem materials.

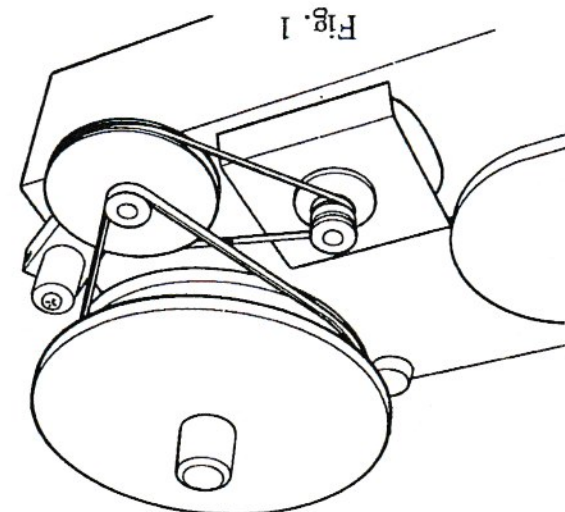


Fig. 1

Available as an extra from the company is a speed reducer. This fitment can be fitted with ease to one of the splash pan support legs. This speed reducer will allow speeds down to within a few revolutions per minute with infinite control. Change back to normal range is a simple matter of moving the drive belt from one pulley to another without the recourse to move any item physically. It is suggested that serious consideration be given to fitting this item when, after experience, you may decide to use ceramic laps for polishing. Ceramic laps are best used at low speeds, and in some instances stationary, when polishing some gem stones.

Sawing on machine

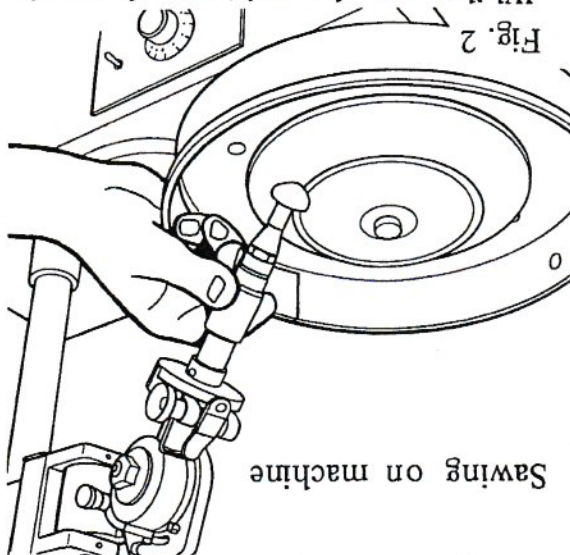


Fig. 2

Whilst on the subject of attachment I would also like to make mention of the saw attachment available for the Gemmasta. When I

first heard about the saw I thought 'another gimmick'. Since then I have come to realise the quality of their products and also their policy of not making or producing anything that does not work effectively and simply. A friend suggested that I was wasting a lot of time and also wearing out expensive diamond laps whilst grinding away at a piece of rough. I purchased the saw attachment and like all good items wished I had done so years ago. The accessory consists of a block of accurately machined aluminium onto which is fitted a small diamond saw. The whole being attached to the master lap by a long bolt. To use the item you set your rough on a dop in the handpiece, set your mains angle on the protractor and by use of the vertical height adjustment place the rough so that it sits with the cullet point just above the rim of the blade. Start the water drip and with finger pressure only against the rough push the rough towards the blade, pressing only on the rough, not on the handpiece. Seconds later you have rough cut your first main, continue around at normal index settings and your mains are cut in, accurately. You will significantly reduce your cutting time and also save a lot of wear on your diamond laps.

One of the most important aspects of your Gemmasta is the capability to bring the hand piece (25) up over the lap from any position on the base. On many machines it is not possible to have the handpiece vertically over the lap. On the Gemmasta it presents no problem, bring the mast up towards the splash pan, lock off the mast base and the handpiece can be positioned at 'O' on the protractor over the lap. If necessary you can swing the mast around so that the mast itself is almost touching the splash pan to come further in towards the centre of the lap, thus using all of the lap area. Use the coarse locking screw to bring the stone down to within 1/2 mm of the lap. Now use the fine vertical adjustment (19) to gently lower the

A feature of the machine is the self-centring collet (44) and the

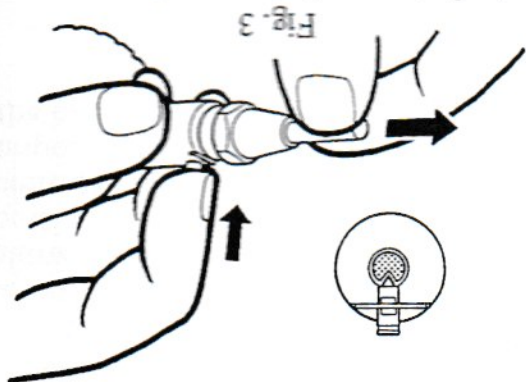


Fig. 3

stone into lap contact. Whilst doing this hold the handpiece back against the 'O' stop to stop any possibility of the stone kicking out.

Another important feature of your machine is the ease of changing from one index wheel to another. Index wheels available are 64-80-96-120. Your machine will have been supplied with a 64 wheel. I strongly recommend you procure a 96 index wheel. More than 80% of faceting designs are based on 96. A recent magazine article suggested that there were 2,000 designs available. It is possible to convert from 64 to 96 but not always possible to convert down from 96 to 64. The reason for this is that 64 is divisible by 2-3-4-6-8, whilst 96 is divisible by 2-3-4-6-8.

To change your index wheel push the trigger (35) down, with the lock out lever (34). Hold the handpiece (42) firmly and pull towards you, the handpiece will pop out of its locating position (located by three spring balls) (41) use a screwdriver to remove the slotted screw retaining the index wheel. You will note a locating pin, this enables interchange, if necessary, that the major index always aligns with the radial vernier mark. When you have selected the index wheel you wish to use, slip it onto the boss of the handpiece, located with the locating pin and fix into position with the slotted screw. Replace the handpiece on the dop arm spindle, the handpiece will pop back into the right position.

cutting techniques you will find with practise, that quite frequently a stone can be cut without recourse to the cheater. Always begin your cutting session with the screw (33) at 'O' and the line (32) central on the index wheel.

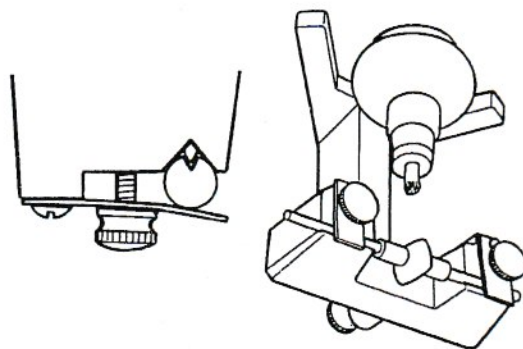
The protractor degrees can be split by means of an angle vernier. The device is such that the pointer can be set to the nearest required degree line, and the angle stop locked by means of a locking nut (30). Then with the micrometer type thimble graduated in 1/10ths of a degree, a much finer setting even a smaller part of 1/100, can be easily achieved. For general cutting it is advised that the thimble be kept on the 5 graduation to allow small adjustments in either direction. Also fitted to the machine is a buzzer, this unique fitment allows the angle to be preset on the protractor (21) and vernier (23). When the handpiece, carrying the stone, comes down to this preset position a buzzer sounds, thus indicating the correct angle has been achieved. It is used to its most advantage when cutting in multiple angles such as mains. It is also useful when cutting the girdle on multi-sided stones. The Gemmasta requires very little maintenance, what is required is regular cleaning to maintain the accuracy of the machine. Realignment of the machine would only be necessary after many hours of professional use or if the head was dropped or bumped.

Outlined is a maintenance procedure followed by the author for many years. When the machine was first acquired accurate test equipment was used to check the alignment of the machine, everything was in order, since then I have checked a number of these machines and have not yet found one supplied that was incorrect. After the cutting of the stone and at the end of the day lift the head off the mast and spray inside the casting with WD 40 or similar compound and

positive on the Gemmasta. With good referred to as a cheater) is very The radial vernier (33) (often More of this later.

The Gemmasta transfer jig has two accurately located pins in the centre of the transfer Vee. When transferring, the dop is located over one of these pins, the dop to which the transfer is to be made is then located over the pin in the Vee on the other side of the jig.

Fig. 4



locating pin (43) by which your dops are held firmly in position. Refer to figure 3. On previous models of the machine when fitting a dop into the handpiece, slide the dop into the collet chuck, adjust the hex headed nose piece to enable the dop to slide neatly in without binding, slowly turn the dop to bring the VEE machined in the dop uppermost, adjust the cone pointed locating screw (43) so that the dop can be slid into the dop arm. Carefully turn the screw in, using an allen (hex) key to enable the dop to be held firmly, do not overtighten using the spanner provided tighten the collet (44) firmly. There is no need, ever, to tighten the locking screw or the collet more than firmly. If the locating screw is overtightened it can cause the dop to be kicked sideways of centre. The collet is used to centre the dop in the arm. The locating pin, as the name implies, is to locate the dop radially in relation to the index wheel. It also allows the stone to be transferred accurately from one dop to another.

wipe clean with a paper towel. Paper towels can be discarded and do not cross contaminate as cloth would do. Slide the mast back and lift it out, spray the mast base with WD 40 and clean, it will surprise you how far the mast can get out of alignment if swarf is allowed to accumulate under the mast base. Also wipe clean the machined base itself, swarf accumulates on this area very quickly, especially when polishing using a slurry.

Fold the trigger back and pull the handpiece off. Shoot a burst of WD 40 up the bore using a pipe cleaner folded in half clean the inside of the bore by twisting the pipe cleaner around. Wipe the dop arm spindle, clean and place a light smear of silicon grease or vaseline on the

spindle. Replace the handpiece. Hold the handpiece vertical with the index gear at the bottom and brush the teeth of the index wheel with an old toothbrush. Place a piece of paper underneath whilst you do this and dispose of the paper afterwards. Wipe the inside of the splash tray clean with a dampened paper towel. It is very advisable to do this thoroughly after each lap is used, this will reduce cross contamination between laps. After one lap is used it is advisable to clean all around the handpiece with a dampened paper towel, brush the teeth of the index wheel and clean the tray before moving to the next lap. It is a lot easier to do this than to try and polish out a scratch or to recut a stone that is badly scratched because of cross contamination.

You are about to start cutting your first stone and you have probably been deluged with verbal and written advice from every quarter. Listening to club chatter one begins to believe that faceting is a holistic science with multitudinous secrets like some ritualistic society with lore that is known only to those in high office. Bunkum. Faceting is a mechanical process of producing a gem from a rough piece of mineral. It is as simple as that.

There are steps to be followed, there are shop practices to be followed, and most important there is self discipline. The machine you have is accurate, so do not blame the machine, any mistakes at present blame it on inexperience.

From that inexperience, learn. The only way you will learn is to make mistakes. Practise, practise, practise. As you make a mistake correct it on the next stone and slowly but surely you will move up one rung of the ladder at a time. Please do not try to get to the top rung in one leap, you will only disappoint yourself and then find you can only go up one rung at a time anyway.

You have a good machine. Get good diamond laps. There are available in Australia some very good Australian made laps, the type I use are made by the Diamond Plating Company. They are steel laps plated with diamond and when they are worn they can be replated. The important thing to remember is that after use you dry them thoroughly, in the sun or with a hair-dryer, place them back in their own plastic bag with the grit marked on the outside and back into their own cardboard box with the grit marked on the outside. This is good shop practise, it stops that dreaded cross contamination gremlin. Wash your hands between lap changes.

I have read a number of books published by a number of houses and most advocate learning on a piece of

quartz, because of its relatively low cost and it is plentiful. One author recommended learning on synthetic corundum, I do not hold with that theory as it is a bit harder to polish than quartz and I believe that it is important for you to learn all the basics as soon as possible otherwise it is easy to become dispirited if one part of faceting takes a long time to master.

It is important that you achieve a high degree of polish on the stones you cut.

This high polish allows the maximum amount of light to reflect from the facets and increase the brilliance of the gemstone. The importance of good polish cannot be over-emphasized. That run up will now allow me to recommend that you do not use mine run quartz. Instead I suggest that you purchase a piece of Blue Quartz. This is natural quartz that has been treated to bring out a blue colour with the additions of minerals. A lot of this quartz is imported from Russia and is sometimes referred to as 'Russian Blue Quartz'. It is free of inclusions, has a good basic shape, the dealer purchases it in slabs and saws it to size. You will need a piece approximately 1mm Round or Square and about 8mm deep.

There are a number of items necessary to start faceting and I have listed these below:

- (1) only 8" 260 grit diamond disc.
- (1) only 8" 1200 grit diamond disc.
- (1) only 8" Lucite lap preferably 3/8" thick.
- (1) only Alcohol burner for melting wax.
- (1) only stick of faceting wax, such as Gemmasta Super Wax. It must be faceting wax.

stones after transferring. The plain type and the cone type have vees machined down their length to aid in setting the dop in the hand-piece.

- Plain ended type of various sizes, these are used to hold the flat (table) end of the stone.
- Cone type, these are used in transferring to hold the pavilion end of the stone.
- VEE type are used to hold the pavilion end of rectangular type stones after transferring.

With your machine you will have received a variety of dops:-

they save a lot of work.) rough shape of the finished gem, machine, been preformed to a general gem rough that has, by hand or to preforms. (A preform is a piece of grit wheel for grinding the gem rough can also be used with a silicon carbide there. Or you can purchase a type that club you can use the one located rough. If you belong to a lapidary 0.008" wide for trimming the gem or 6" trim saw, the thin type about You are going to need access to a 4"

years. spirits. That much will last for in 3 tablespoons of methylated about ½ teaspoon of orange shellac you wish to make your own dissolve It precoat the components. If dop with before applying the wax. used to coat the stone and the A small bottle of 'Dopeeze'. This is

useless for checking facets. smaller type as they are facets. Don't purchase the enable you to check the (1) 10 x 3/4" diameter glass to faceting.

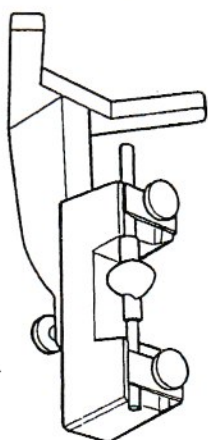
(1) 2½ x loupe to wear whilst powder.

Small quantity of cerium oxide hole in one end 1" deep.

(2) only 1" diameter wooden lotion type.

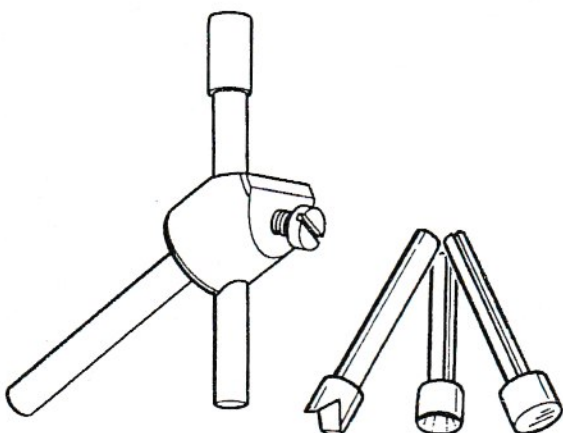
(1) small squeeze bottle to keep metho in for cleaning. Suntan

Fig. 6



You will also have a 45 degree adaptor, this is used, with the protractor set at 45 degrees to enable the table to be cut and polished. More on this later. Also you will have a transfer jig. This is used to allow the transfer of the stone from one dop to another. It is a very accurate piece of equipment. I would suggest you make up, from 2 pieces of 3" x 1" pine 6" long a corner bracket so that you can stand the transfer jig up onto it, this allows the jig to be used vertically. I am sure you will find that upright it is easier to first mount the stone on the dop. The rough can be placed centrally on a dop at the bottom whilst being mounted on the dop in the top section. I will go into this further when explaining how to dop stones. Gemmasta also has available a stand to mount the transfer block vertically.

Fig. 5



I am sure that all the books you have read and a lot of those facetors you have met have told you that your first stone will be a 'Standard Brilliant' cut. This cut is the cut you most see in diamonds and the diamond simulants such as Cubic Zirconia. It has 57 facets. It is round in shape.

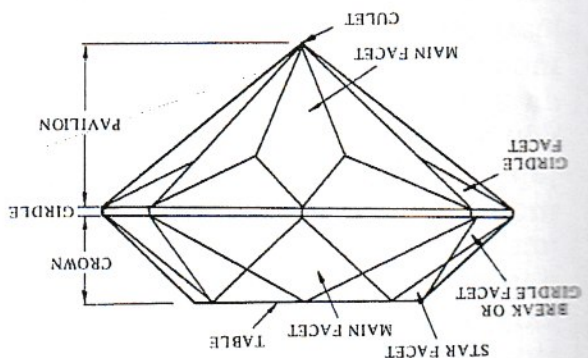


Fig. 7

I am going to teach you a little differently. Whereas I have no objections to this cut as one to produce a stone of some brilliance it leaves a lot to be desired as a first stone. I want you to cut an octagon shaped stone as your first stone.

The standard brilliant being round in shape makes it that bit more difficult for a beginner. When starting off you must learn to cut by feel, when forming the shape of the round stone the dop arm is set horizontal, that is at 90 degrees, and the handpiece is put in free-wheel, the trigger is held back from the index wheel. The beginner then has to rotate the handpiece and at the same time apply pressure down for the stone to be abraded by the disc. As the stone is cut away and the stone becomes more circular it is very difficult not to take hold of the handpiece, rotate it and at the same time maintain an even pressure. This multiple function of events can be achieved, but only after a lot of practise and many stones cut. If the outside of the stone, the girdle line, is not perfectly symmetrical trouble will be encountered later, especially when

cutting in the main facets. If the girdle is not symmetrical, the mains, having to all meet at the culet, will be of different lengths. These lengths must be identical otherwise the meets at the girdle line and also where the girdle or break facets meet on the mains, half way down the main will not meet correctly and the whole becomes a frustrating exercise.

Also a lot of text books advocating the crown first. To achieve the most brilliance from a stone the pavilion facets have to be at the angle most suitable for the Refractive Index (RI) of that stone as most of the brilliance from the stone comes from the pavilion. You cannot cheat on the angles on the pavilion, to do so will only result in what is referred to as 'fish eye'. In effect you look right through the stone, there is no reflection from the facets. It therefore follows to cut the pavilion first to get the angles correct. If you find that the crown angles cannot be met you can to some degree lower the angles on the crown, you will not achieve the maximum brilliance but the loss will in no way be the same as having cut the pavilion angles incorrectly.

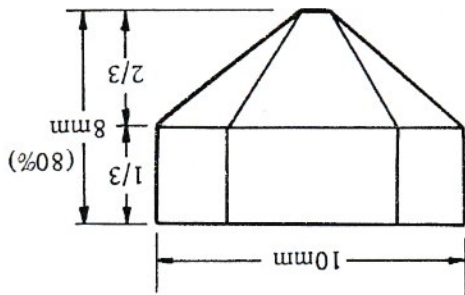


Fig. 8

If you have a look at the diagram of the preform you will note that I have suggested a stone of approximately 10mm wide. On an average the depth will be 80% of that i.e. 8mm deep. Dependent on the R.I. of the material these ratios do change, for this exercise

Using a silicon carbide wheel begin to preform the stone. As the piece you have selected is roughly square begin the preform by grinding off the corners as shown in the diagram until you have eight even sides. From those eight sides rough form down to a cullet (centre) point at approximately 45 degrees. See diagram.

When you have completed the preform place the dopped stone in your freezer and in a short while the stone will have popped off the dop. Clean away the excess wax with a hobby knife, clean with metho again. Select a plain end dop stick about 1/4 diameter and clean with metho. Paint shellac metho solution onto both, dop stick and stone table with a touch up brush. Do not touch this area with your fingers. Warm stone on warming oven, and with dop stick held in a wooden handle, also heat dop stick until solution on both stone and dop stick bubbles and begins to dry. With flame on the dop stick stem, hold wax stick on top of the dop until a small amount of wax melts onto the surface required. Immediately push warm stone and dop stick together. Position stone with wetted fingers so that a flat on the girdle is in line with the groove in the dop stick. Mould any excess wax onto stone keeping fingers wet. Wax can be reheated for readjustment of the stone. As soon as it is cool, you are ready to start cutting. Loosen the hex nut on the handpiece and slide the dop into the dop arm. Locate dop with pin as in Fig. 3. Firmly close collet nose piece (hex nut). Now with spanner provided and pressing on locating pin, tighten the nose piece. It only has to be firm, you are not trying to pull down the bolts on a cylinder head on a car. Set your cheater at 'O'. To digress for a moment, Gemmasta now have their right hand and left hand scales on the cheater dial marked R and L as in Figure 10. This is very useful for recording. As you cut your stone it is advisable to keep a record. If perhaps you have to cheat a little

80% is close enough. Make your preform about 11mm wide this will give plenty of leeway. The crown will be one third of the depth of the stone and the pavilion two thirds, these figures hold close for all stones. The percentages are a good average to work from when purchasing rough faceting material and you wish to imagine how the stone will cut out of the rough. If you have been involved with the cutting of cabochon up to this point and are now moving onto faceting you will probably have some dopping wax and an alcohol burner. We now need to make up a preform. Decide which flat section you are going to use for a table, remembering that it will need to be about 11mm wide and 8mm deep. If you wish to you can hand hold to do the preforming or use a wooden dowel for a dop stick. Clean the 'table area' with some methylated spirits and a piece of tissue, do not touch this area with your fingers, body oil will stop adhesion of the wax. With a match stick place a very thin film of dopeeze on the table area. Light your alcohol burner, you can use green or brown wax for this, place about a teaspoonful of wax in a cut down baby food tin and place it over the flame. I have shown a sketch of a typical burner holder. At the same time place the stone on the top to preheat the stone. When the wax becomes mobile or thins out, pick up the piece of dowel, spin it in the molten wax and place the wooden dop with wax firmly onto the stone.

Stand for metho burner

sizes are approximate.
4" wide; 4" deep 5" high

Place stone
here

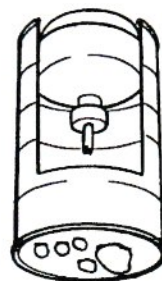


Fig. 9

Fill your coolant tank with water and add about three drops of washing up detergent. Detergent is a wetting agent and will allow much freer dispersion of the waste material from the lap.

Bring the dopped stone down, at 43 degrees to within $\frac{1}{2}$ mm of the lap, turn on the coolant tap to allow about one drop of water every four or five seconds. Turn the motor control to forward with the variable control off (the rotating knob) and switch the selector into variable. Slowly turn the rotating knob until the lap starts to move, wipe the water across the lap with your finger and lower the vertical screw down slowly until the stone just starts to grab. Raise the handpiece and turn the fine height adjustment thimble (19) down one division. Lower the handpiece and you will feel the stone cutting. If necessary you can adjust the water flow so that the stone remains wet. Have the drip about the centre of the 260 disc; this will allow centrifugal force to carry the water across the entire lap.

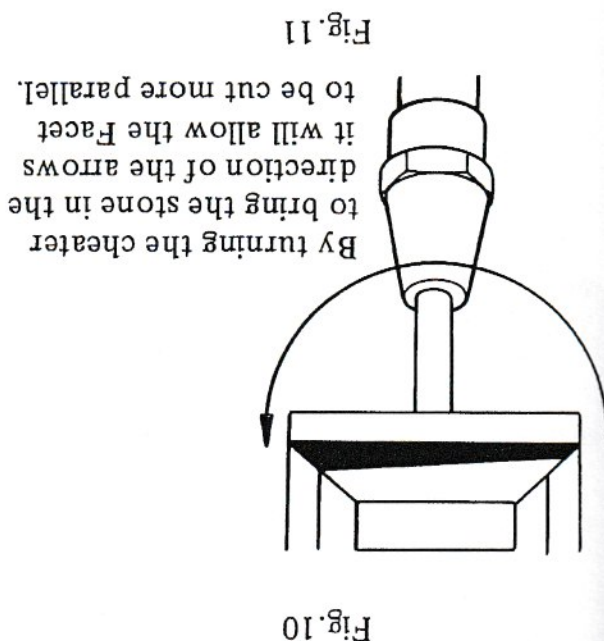
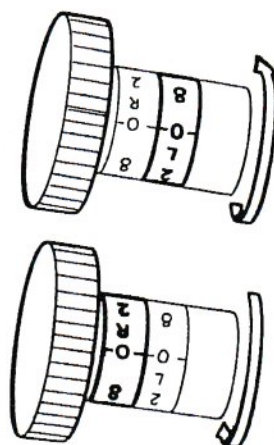


Fig. 10

on one particular facet you just write down (1) the angle, (2) the index and (3) how much you cheated. Thus $43/64$ R $1\frac{1}{2}$. So, at angle 43 degrees index 64 you moved the cheater one and a half divisions on the right scale. When you come to prepolish and polish it saves a lot of grey hairs.



You have set your cheater, now set your angle, this will be 43 degrees on the protractor, as 43 is the best angle on the mains for quartz material on the pavilion facets. Raise the whole head assembly so that the stone is clear of the 260 lap. Set the index wheel to 64. Set your fine height scale (18) at about the 15mm mark. This will hold the assembly central and allow plenty of leeway for movement up or down.

Fig. 11

Sweep the stone firmly across the lap, ALWAYS HOLD THE STONE in your fingers, do not press on the stone popping off the dop. This holds good for all cutting and polishing. After a couple of sweeps in the area shown in the sketch you will find the stone has stopped cutting and your buzzer would have sounded. It is important that you learn to listen for the cutting to stop and look at the progress of your cutting. As we are cutting an octagon you will be using what is referred to as eight fold symmetry. Under the numerals on your index wheel marked 8-16-24-32-40-48-56-64 is the numeral '8' indicating eight fold. This is a very handy reference method when cutting octagonal stones.

As we are cutting eight fold release the trigger and rotate the index wheel to 32, cut down at this setting.

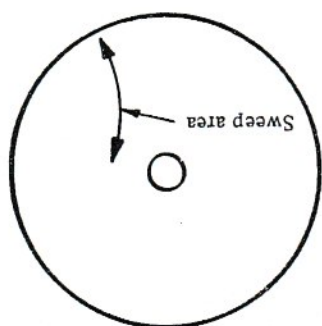


Fig. 13

Hold up the handpiece and have a look at the areas cut, if the two cuts do not meet at the cullet feed down another division and cut 32-64 again. You will find that in a short while you will have a meet at the cullet. When you have this meet set your index to 48 and cut down until the disc stops cutting. Now move to 16-48 : 8-40 : 24-56 until you have a perfect meet at the cullet from each index setting.

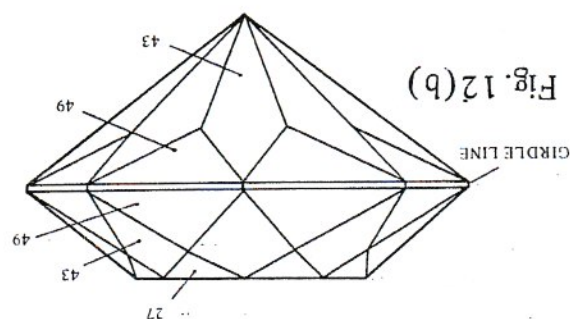
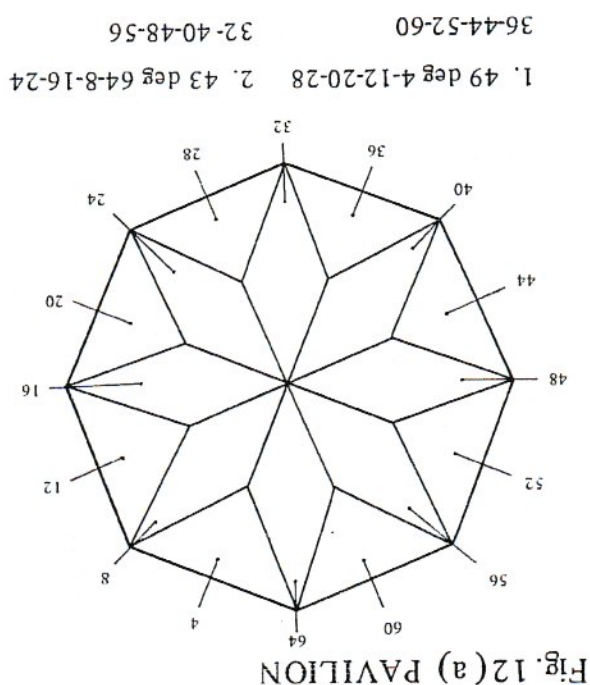
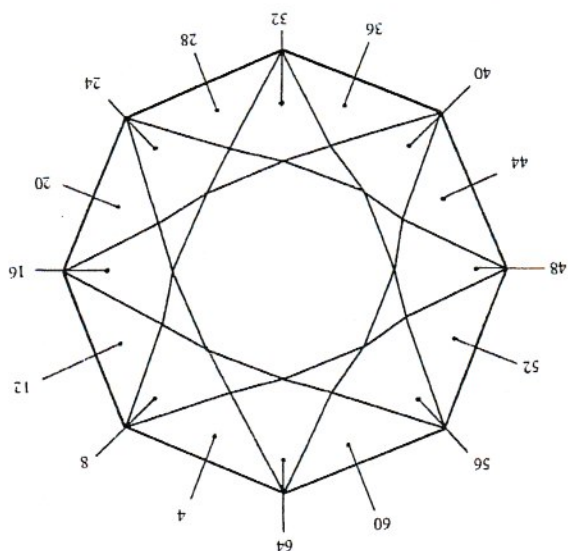


Fig. 12(c) CROWN



1. 49 deg 4-12-20-28-36 3. 27 44-52-60 2. 43 64-8-16-24-32 40-48-56 4. 0

going to cut now is the actual outside of the stone and you will cut so that you create a meet with these facets to exactly coincide with the mains and the break facets that you have previously cut. These facets will be cut in at index 4-12-20-28-36-44-52-60. Use your loupe and check each cut as you do each facet to create the girdle line of the stone. I will be referring to it again but get used to the word **CATALAL**. It means Cut A Little And Look A Lot. If you follow that you will not go far wrong.

Now that you have cut them all in you can do some good housekeeping and then do them all again. Raise the handpiece and put a bit of newspaper or paper towel under the index wheel, get an old toothbrush and clean the index teeth, wipe the handpiece with a paper towel previously wetted. Remove the 260 disc and wash it with solvent under running water. Dry it off in the sun or with a hairdryer put it in a plastic bag and put it back in its box. Good housekeeping methods are not difficult to learn. It is a lot easier than recutting a stone. Wash your hands. Mount the 1200 lap onto the machine and using the 90 degree angle and the same index setting just clean up the 260 mark on the facets so that you have a nice matt finish. When you are satisfied that all the 260 grit marks have gone replace the gate, set your protractor to 43 and with the same index settings just cut the mains until you have that same matt finish with no obvious scratches when seen through the loupe. With the mains recut do your break facets at the alternates 4-12; 20-28; 36-44; 52-60; again you must get an exact meet at the girdle with the mains. Take your time doing this as it is important to get the meets cut in rather than try and polish them later. When you are satisfied that you have the meets in and all facets have the same matt finish, clean the machine with a paper towel and wash your hands.

Set the protractor at 49 degrees and the index setting to 4, lower the head once more to put the stone within 1/2mm of the disc. Lower the fine height adjustment so that the disc just grabs the stone. Feed in half a division and start cutting, just do a small cut and take a look at it, it should not be near the centre of the other facet, move to 12 and take the same cut, now go back to 60 and take the same cut, you should be establishing a pattern of bringing the 60-4-12 combination to cut in towards a common point. When this point generates you will have established the position of your girdle line. Go on and cut in these facets at 20-28-36-44-52 but do not yet allow them to quite meet at the point on the girdle. These facets you are cutting are referred to as break facets or girdle facets. When you have almost established a 'meet' just feed in enough to actually make the meet but check each meet as you go, do not rely on coming down always to the exact position with the buzzer nor 'because it met there with the last facet it should meet here also'. Get yourself schooled into always checking. When the meet comes together your facet should be about halfway down the main, don't worry if it isn't, I am more interested in you becoming used to a hands on exercise with a machine rather than trying to cut a competition stone. When you have established the meet on all break facets, stop the machine and swing your protractor to 90 degrees (horizontal) remove the gate (12) and put the splash guard on and set your index to 4. Make sure that the handpiece locates centrally in the gate area.

Put the nose piece just back from the edge of the disc, the stone will be about 3/4" in from the edge of the disc. Lower the stone to within about 1/2mm of the disc. Set the water running and the lap rotating and lower the stone to just grab the disc, feed in about 1/2 division on the fine height adjustment thimble. What you are

The first facets to be polished are the girdle facets at 90 degrees. Squeeze some polish onto the lap, about half a teaspoonful will do and work it around the lap. Set the machine onto a slow speed, lower the stone to just touch the lap then feed in one division, move the stone across the lap with a firm pressure and check. You will see that it has started to create a shiny spot, continue with pressure and check. When it is polishing there will be a definite 'grab' feel about the stone. When the polish is established to go to the next facet. Polishing is something that you will have to experiment with there are no definite rules. If the polish does not come up quick, increase the pressure a little. If that does not bring it up vary the speed, again a little, up or down. You will find a combination of speed and pressure, also whether the polishing compound is wet or 'dry'. It is something I cannot give you a recipe for. As you facet you will notice that the speed can make a difference, as will the pressure or the size of the facet. Experiment.

DO NOT OVERDO THE PRESSURE, LIGHT PRESSURE WILL ALMOST ALWAYS WORK.

Set the protractor at 49 degrees and index to do the break facets. Bring the stone down with the fine height adjustment so the stone just grabs on the polishing lap. Release the locking screw that holds the protractor and gently lower the stone to touch the lap with slow speed. Apply a little pressure to the stone, lift it up and look at the facet. It will have begun to polish in one area. Looking at it probably at the bottom of the facet, if this is the case it will be necessary to adjust the fine height adjustment. When the handpiece is lifted you are looking at the facet with the cullet uppermost. If it is necessary to cut or polish closer to the cullet, it is necessary to lift the fine height adjustment. If you need to polish away from the cullet you lower

Before going onto polishing the facets you will have to prepare the Lucite (Perspex) lap. As mentioned at the beginning on what was needed to facet, mention was made of the Lucite lap, get one preferably 3/8" thick, if it is possible to get one thicker by all means do so as there is then less tendency for it to bend or buckle under constant pressure.

From a hardware store purchase a piece of 'Wet and Dry' paper, this is an abrasive paper used in the painting industry particularly for rubbing down the paint on car bodies in panel beaters shops. Get one that is graded 600.

Cut a piece 6" square and double fold it so that you have a four fold 3" square, hold this with a piece of 2" x 1" timber about three inches long. Place the lap on a piece of towel or white paper and wet the 600 paper. With a figure 8 motion you will abrade the surface of the lap. Wet the paper and starting at the top of the lap work a figure eight onto the lap, keep turning the lap and keep doing figure 8's across and down the lap until there is an even matt finish right across the lap. To give you an idea it will take about ten minutes to create an even matt finish. When you have done this wash the lap with detergent to make sure there are no abrasive particles on the lap.

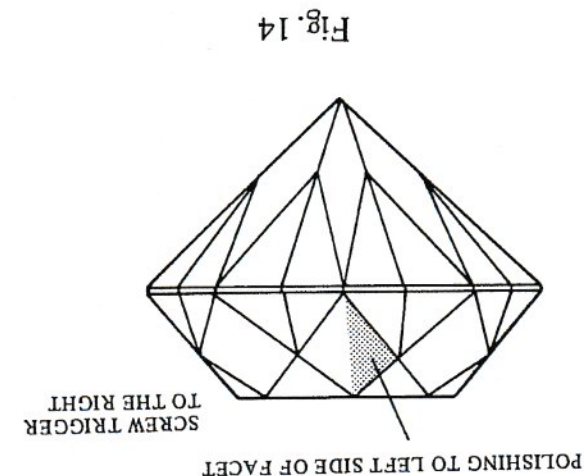
Some books and some instructors advocate scoring the lap with a sharp hobby knife or razor blade, I can assure you this is not necessary, in fact it can cause problems with foreign matter building up in the grooves. What is not taken into consideration with this theory of scoring is the cerium oxide is a very fine abrasive and there is no need for heavy 'scores', the 'pitting' you have created with the 600 is quite deep enough to capture the cerium oxide and present it to the gemstone for polishing.

Mix up some cerium oxide with water to the consistency of honey and put it into a squeeze bottle. Cerium oxide dries out very quickly.

down the facet use the area just in front of the lap nut in line with the mast, this will then polish across the scratches thereby eliminating them. You can decrease and increase the speed of polishing by polishing close into the centre of the lap or more towards the outside of the lap where the peripheral speed is greater. The pressure exerted down on the stone can have a large bearing on the speed of polishing. Do not overdo the pressure on the stone as this can cause the facet to cut through the surface of the lucite. This then causes scratches to appear on the facet. If you make a change to the radial cheater make a note as previously outlined, what angle? What index? How much? With the Gemmasta angle vernier it may be that there is no necessity to unlock the protractor nut when doing the break facets. Any vernier height adjustment can be achieved with the angle vernier thimble. This is a very sensitive device and can be used as a micro adjustment. When the break facets have been polished, set 43 degrees and with the index wheel at 64 lower the head to within 1/2 mm with the protractor nut locked. With the vertical height adjuster lower the facet to touch the lap with water keeping the lap wetted. As soon as touch is made check the facet and note any adjustments as necessary. Take time to look at the facet and note whether it is necessary to adjust up or radially, make minor adjustments and check again. Whilst polishing the mains it must be noted that it will be necessary to refer to the position of the break facets to ensure that the 'meets' of the break and main facets are exact. When you are completely satisfied that you have polished out all scratches and that the meets are correct you can remove the stone from the handpiece so that it can be transferred.

Before transferring the stone do your housework and clean up the tray and surrounds.

the height adjustment. To explain, with the protractor nut loose the handpiece is free to adopt any angle, if you lift the height adjustment with the stone on the lap the stone will cut more to the cullet as the angle with the lap has changed, if you lower the height adjustment the opposite occurs. To check this put your eye level with the lap with the stone on the lap and feed in a large movement on the fine height adjustment whilst looking at the stone with a light behind, you will see the stone come up onto the cullet point. An easy way to remember this is to raise the handpiece, look at the facet, if you need to cut 'up' -- 'go up' --- if you need to cut 'down' -- 'go down'.



Whilst we are on the subject of adjustments for cutting and polishing we will consider the radial vernier (cheater). With the handpiece in the vertical position we are looking at the facet being polished or cut. If the polish needs to be greater on the right side of the facet, looking at the facet, turn the top of the radial knob away from you this will bring the right side of the facet further towards you and so will touch the polishing lap first. Polish all of the break facets until you cannot see any scratches with a 10x glass. When looking at the facet and fine scratches appear to be running

After removing the dop from the handpiece clean the stone with metho and allow to dry. Place the stone and dop in one section of the transfer jig with the vee in the dop over the pin in the bottom of the vee in the transfer jig and tighten the knurled screw.

Select a cone dop about two thirds the size of the stone. Place cone dop in wooden handle, paint metho shellac solution onto pavilion of stone and dop stick cone. Also paint a little around the outside of the dop stick head. Warm dop to dry solution as before. Apply enough heat to fill the cone with melted wax. Allow the dop to cool just enough to be handled and place it in the other end of the transfer block being sure to locate the V an pin. Keeping the cone and flame well away from the stone get the wax molten again. (Enough warmth will be present to have just dried the shellac on the stone.) Slide the two dops firmly together. Tighten V block clamps and mould spewed wax around dop and stone with wetted fingers. Keep moulded wax away from the stones girde, and allow the set up to cool thoroughly.

While wax is setting soak a shoe lace around the pavilion end of the stone and dop stick. Gently warm the tail end of the dop stick that is to be removed until its wax starts to melt, and allow the dop stick to drop off. Scrape off excess wax from the table with a warm stanly knife or safety back razor.

Now we are ready to cut the crown but first the stone has to be put back in the handpiece. Mount your 1200 grit lap up temporarily. Put the dop into the handpiece using the method previously suggested, bring your protractor around to 90 deg. and your index wheel to 4. Make sure that the cheater is at '0'. Bring the fine height adjustment down or the whole head so that you have the stone just off the disc, very carefully lower the

fine height adjustment, at the same time slowly sweep the stone across the disc and you will hear a faint whisper, get your ear down close to the lap, 90% of all cutting is done by ear. When you hear the first swish lift up the handpiece and have a look at the edge of the facet, you will see a slight polish mark, adjust your cheater if necessary and try again until you have the polish mark right across the girde edge. This is now your central mark **write it down**. Take the facet head assembly back up and set in 49 deg. on the protractor, make sure the angle vernier is at zero. The first cut you will do will be the break facets. Put the 260 disc on the machine. Your indexing will be 4-12-20-28-36-44-52-60:

Cut around so that you have a meet with 4-12-20 etc and cut down so that you have about 1/2mm width girde.

Set your protractor at 43 deg. and index at 64-8-16-24-32-40-48-56. As you do these maintain the opposites, i.e. do 64-32 then 16-48 etc.

Much discussion has taken place on the exactitude of lining up the pavilion mains with the crown mains on how it effects brilliance. In competitions points are deducted if they do not line up exactly. For normal cutting tests have shown that the loss of brilliance is minimal.

Cut in the mains to arrive at a perfect meet of the girde the four lines should meet exactly. That is the girde on one break the mains on that side then the mains on the other side then the girde on the next break. The girde line should be parallel to the girde from the pavilion.

Set your protractor at 27 degrees for the star facets and start at 4 on the index. These will be cut at the same index settings as the breaks. Do these on the 1200 disc don't attempt them with the 260 it will be too coarse. Be very careful with them they cut in quickly. Touch 4 then 12 then 20 you

After removing the dop from the handpiece clean the stone with metho and allow to dry. Place the stone and dop in one section of the transfer jig with the vee in the dop over the pin in the bottom of the vee in the transfer jig and tighten the knurled screw.

Select a cone dop about two thirds the size of the stone. Place cone dop in wooden handle, paint metho shellac solution onto pavilion of stone and dop stick cone. Also paint a little around the outside of the dop stick head. Warm dop to dry solution as before. Apply enough heat to fill the cone with melted wax. Allow the dop to cool just enough to be handled and place it in the other end of the transfer block being sure to locate the V an pin. Keeping the cone and flame well away from the stone get the wax molten again. (Enough warmth will be present to have just dried the shellac on the stone.) Slide the two dops firmly together. Tighten V block clamps and mould spewed wax around dop and stone with wetted fingers. Keep moulded wax away from the stones girde, and allow the set up to cool thoroughly.

While wax is setting soak a shoe lace around the pavilion end of the stone and dop stick. Gently warm the tail end of the dop stick that is to be removed until its wax starts to melt, and allow the dop stick to drop off. Scrape off excess wax from the table with a warm stanly knife or safety back razor.

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vertical riser. What you are trying to achieve here is a meet of all the star facets. It may be necessary to unlock the protractor locking screw and use the cheater or fine height adjustment or the angle vernier to just bring the meets in to place. When you are satisfied that they all meet edge to edge hold the stone down on the lap, machine stopped, and lock the protractor off, this will maintain your angle. Fit the lucite lap and polish the table. It is by far the biggest facet, so you will have needed to get everything clean as you do not need unnecessary scratches on the table. Start with a slow speed and bring the head down to just touch, you can release the protractor locking screw and apply a little pressure right over the stone raise the handpiece and have a look at the witness mark. Adjust your cheater or angle vernier as necessary, a couple of touches should have the polish across the table. Always keep the stone moving, however slightly, and with a little pressure, if you keep in one area you will notice that corrugations appear on the table.

These can be removed by moving the stone into another and opposite position. By doing this you will be polishing across the corrugations, so eliminating them. Corrugations can also be caused by an excess of polishing medium. The polish 'balls' up between the facet and the lap, this will cause the scratch or corrugation to form. If it appears that the polish is not establishing quickly move to another part of the lap so that the peripheral speed of the lap alters i.e. from outside to inside of the lap or vice-versa. The speed can also be altered by the electronic speed control. Sometimes it is necessary to use a dryer polishing medium. Experiment.

After you are satisfied that you have polished the table remove the stone from the adaptor. Place the doped stone in a wood dowel and light your metho lamp. Start heating the dop about 3/4" back from the stone whilst rotating the dowel, hold

have to bring these to meet at the top of the mains and also at the top of the girdle facets, take it very carefully. When you have established this go back and do the girdle facets with the 1200 disc, then the mains and finally the stars will need a retouch. Get a good matt finish on all of them. Do your house work and polish with the lucite lap.

You are about to cut the table in, there are a couple of items I would like you to get. A small 90 deg. square about 3" x 2". Have a fitter and turner or model engineer check it for you. A piece of brass, stainless steel rod or silver steel 1/4" diameter and 4" long and a piece of white card 4" x 3". Having got all of those set your protractor at 45 deg. and fit the 45 deg. adaptor into the quill, bring it down, with the head to about 1/2mm above the master lap. Loosen the chuck, just loose, and slide the adaptor out so that it rests firmly on the master lap. Hold it in place with one hand and lock the chuck with the spanner.

Raise the head about three inches and fit the 1/4" rod into the adaptor with about 3" hanging down, lock it into the adaptor. Bring the head down so that the 1/4" rod is about 1/8" off the master lap. Place the white card about where the gate is and use the square to line up the rod. If you can see daylight between the edge of the rod and the square adjust it out with the cheater until no light shows. You can now check at 90 deg. to that i.e. longitudinally, you will find that it is square if it is a little out it can be adjusted with the angle vernier. Take the rod out of the adaptor and fit the stone into place. Get the stone up close to the adaptor for stability. Make sure your vertical riser is around the 15mm mark, again stability, lower the whole head to within 1/2mm of the 260 disc and start the machine. Cut down so that the stars don't quite meet at the table. Do your housework and fit the 1200 disc. Bring the stone down, with the

Your next stone is going to be rectangular with the corners cut away. It is normally referred to as an Emerald Cut. The reason I want you to cut this style is to give you experience on long narrow facets. Make up your preform to the sketch shown. We will use a rectangular piece of quartz. The reason I want you to cut this style is to give you experience on long narrow facets. Make up your preform to the sketch shown. We are aiming at a length to width ratio of 2:1, it is not critical if it is a bit off. The main exercise is the cutting of parallel facets. Make the stone about 12mm x 6mm. This is an easy size to control.

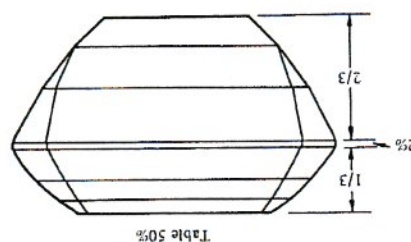
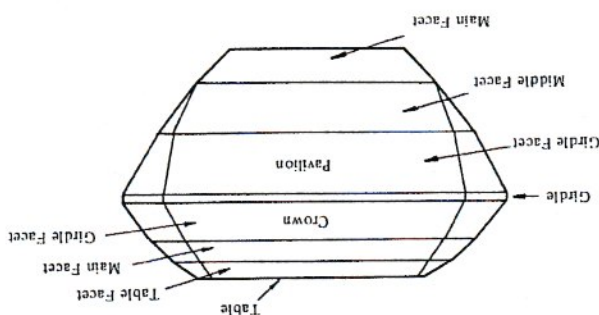
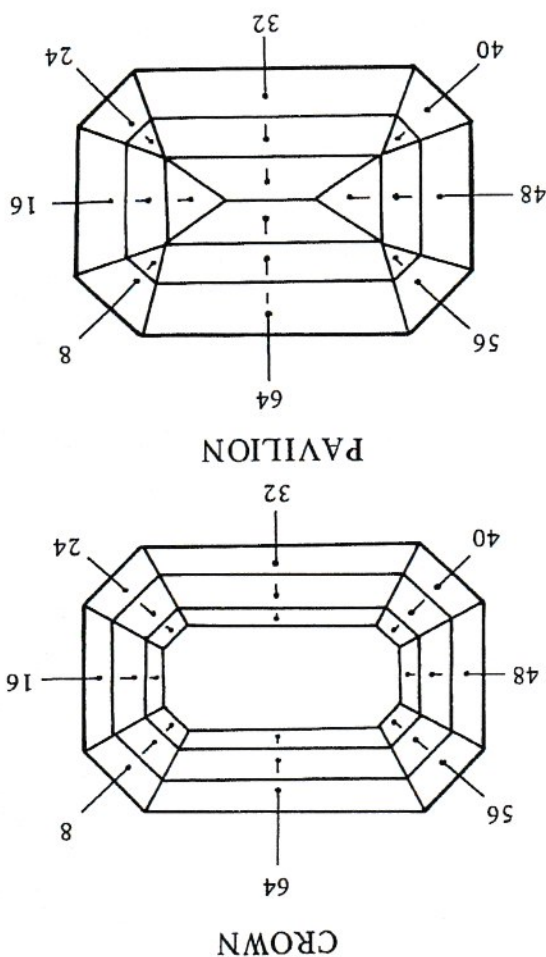
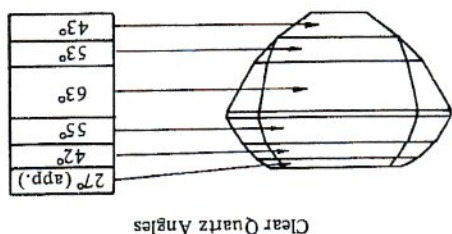
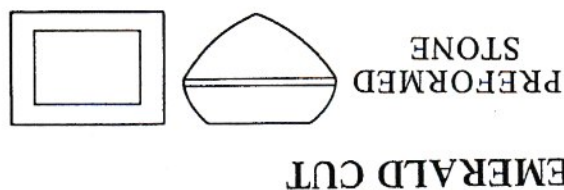


Fig. 15



the stone with your thumb and forefinger, by doing this you can judge the heat of the stone, gently extend the stone from the dop by pulling the stone with one hand and the dowl with the other. If the stone is too hot to handle move further away from the flame, it's too hot for the stone!! The stone will pull from the wax very quickly. If there is a residue of wax, allow the stone to soak in metho and wax will soften. Wipe the stone with a tissue and grab it with gem tweezers on the pavilion, get a good light (sunlight) over your left shoulder and take enjoyment from your first stone. Looking through the table there should be no 'dark' spot, this would be fish-eye, that means you are looking right through the stone and your main angles on the pavilion would have been incorrect. There should be none. The angles I have given you for quartz are safe angles.

you can polish the stone. Perhaps you had recourse to use the cheater, do not let this alarm you but do get into the habit of writing down where you cheated and by how much, as earlier described. You will need these figures when you start polishing. Record the figures in for that index angle and by how much you cheated before you start.

If it is necessary to use the cheater, lift the handpiece and look at the actual cullet line, the facet line above should be parallel to the cullet line, the line above that should be parallel to both. If there is a variation look at the illustrations Fig. 10 and 11 and it will explain the rotation of the cheater. You must become acquainted with the use and result of that use of the cheater. With the handpiece raised you decide the direction to rotate the vernier on the cheater. If you move the TOP of the knob away from you the cut will be on the right side of the facet **LOOKING AT THE FACET**. The opposite applies. Feed in a little of the cheater at a time and check again taking the lightest of cuts. Mark down how much you have cheated to establish the parallel and on what angle and index. Don't rely on your memory. Measure the height of the pavilion.

Next cut the table, this should be cut down to half the height of the pavilion (previously measured). When setting up to cut the table always set the stone so that the greater length is across the lap, this makes it a lot easier, if it is necessary to use the cheater, you have a definite reference point. Cut and polish the table.

When transferring to the handpiece to cut the crown facets you will have noted that there is no vee down the dop for relocation in the handpiece. With a craft knife very carefully remove any surplus wax that has extended beyond the sides of the stone. Cut it away and back at an angle. Fit the 260 disc.

With the cheater on '0' and the index at 64, have the dop just held

Using the 64 index and the 260 grit disc cut in the first side, turn to 32 and cut in again. When these two sides have been established go to 16 and lift the vertical riser, bring it down to just touch, then revert to 48, cut these in, at the same time, with the same height setting, cut in 8,24,40 and 56. Set your protractor to 43 deg. and index 64 and 32, establish the cullet point. It will be a knife edge. You can sketch on paper and allow 1/3 for the crown 2/3 for the pavilion. From the 2/3rds for the pavilion split that in half, the top half of the pavilion will be cut in at 63 deg. and the bottom half will be divided into two, 1/3rd for the 43 deg. cut you have just established the 43 deg. cut for the cullet, cut in the 53 deg., making the top of the facet half the pavilion height. Now cut in the 63 deg. and when you do the ends (16 & 48) also cut in 8,24,40,56. Go back now to 53 deg. and lightly cut again, this time establishing 8,24,40,56. When the 63 deg. was being established the girdle line should be kept straight. If you allow the cut to cut out, that is do not overcut, the line will establish. Most of the cause of uneven girdle lines are caused by under-cutting or over-cutting. It is easy to become over anxious and stop cutting too soon or cut too long. Keep checking your progress. Good habits learnt now will last always. When you are completely satisfied go to the 1,200 disc it is when cutting with the 1,200 disc that you can check for parallelism of the facets. Work the stone across the disc. Remember that the outside of the disc is cutting faster than the inside of the disc and consequently one part of the stone can be cutting more quickly than the other part. If you find that the part on the outer side of the disc is cutting more and this is shown in the lines not being parallel move to the other side of the disc. Use light pressure, you now have a 'head on' situation and if the stone catches it will pop off the dop. When you are satisfied that all facets are parallel

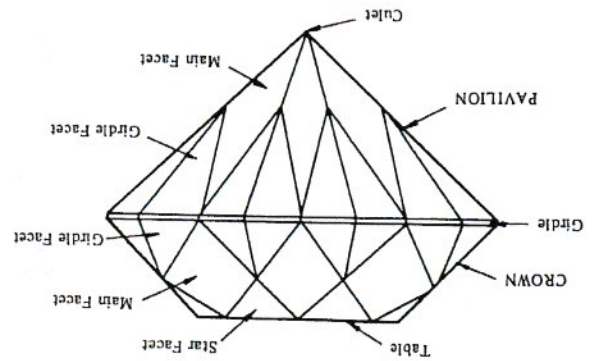
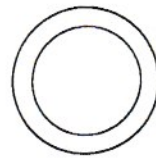


Fig. 16

PREFORMED
STONE

BRILLIANT CUT

Now set up the 1,200 disc and recut all the facets paying particular attention to cutting out the marks of the 260 disc. When you are satisfied that no marks remain set up the lucite lap and polish from girdle to table remembering to check your cheater readings from cutting with the 1,200 disc. Remove the stone from the dop as outlined previously.

Raise the head, set protractor on 55 deg. index on 64 and cut down to a girdle width of 1/2 mm (three razor blades). Continue cutting at 32 then 16; 48; 8; 24; 40; 56. Set the protractor at 42 deg. and cut 32; 64; then 16; 48; 8; 24; 40; 56. Cut so that the girdle facet is half the height of the crown. Next set your protractor to 27 deg. and cut in the next facet, this crown table facet should be 1/3rd of the mains facet.

by the collet, so that the dop can be rotated by hand. Set the protractor at 90 deg. Bring the faceting head down so that the stone is just over the edge of the disc and slightly above the disc (about one razor blade thickness). Lower the riser with one hand and gently rock the stone in the handpiece until it just sits on the disc so that it cannot be rotated. Close the collet chuck with the spanner whilst holding down with your finger.

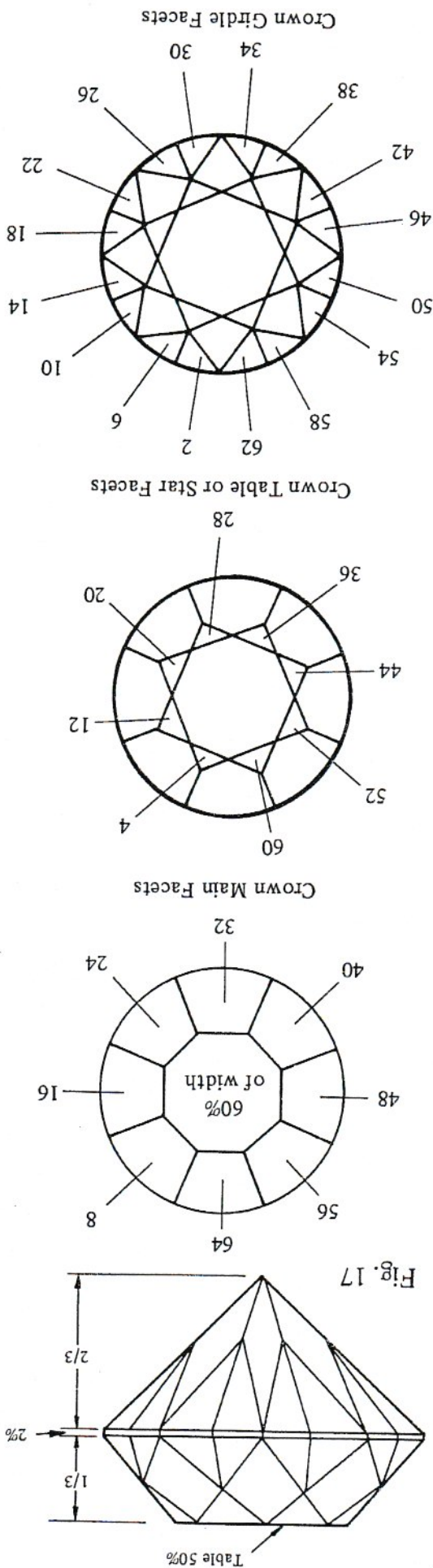


Fig. 17

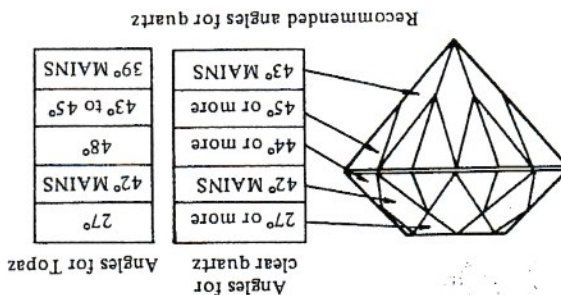
Topaz has a natural cleavage plane and appears singly, it will be noted as a distinct natural fracture like line on the outside of the gem rough. So that this cleavage does not cause a problem on cutting the gem or in polishing it is

is engendered. Topaz has a natural cleavage plane and appears singly, it will be noted as a distinct natural fracture like line on the outside of the gem rough. So that this cleavage does not cause a problem on cutting the gem or in polishing it is

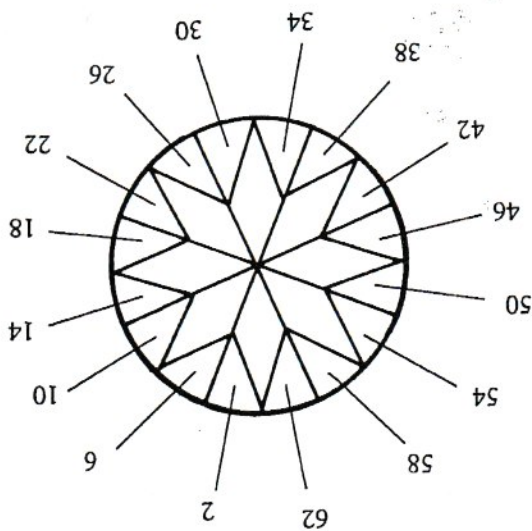
The standard brilliant is one of the first introduced about two hundred years ago and has had many variations. To polish topaz you will require a tin lap, these are available from Germasta as is the Lucite lap used previously for quartz. You will also need a polishing medium known as Linde 'A'. Linde 'A' is a fine powder of Alumina Oxide which is fine particles of Synthetic corundum (Sapphire is of the corundum family). The Linde 'A' is mixed with water to a paste form then used as a fine slurry on the lap until continuous use and application charges the surface of the lap. If you wish you can go to a ceramic lap such as the Zirconium Lap which is used with diamond compound or spray. If you use the zirconium lap it will be necessary to use a pre-polish lap of between 3000 and 8000. From either stage the zirconium can be used, the writer prefers the 8000 lap. The 8000 lap can also be used as a pre-polish for tin laps. However it is not strictly necessary and is a matter of preference and usage over a period of time. The purchase of a pre-polish lap and the ceramic or zirconium lap is basically a matter of economics and whether competition cutting is intended. It must be stressed here that the use of the tin lap and Linde 'A' and for that matter any combinations of surfaces and polishing mediums takes a lot of practice. Whereas the quartz polished in very quickly on the cerium oxide/lucite combination, topaz with tin/Linde 'A' will probably take longer and require some experimentation with speeds and pressures before a satisfactory polish will result. When you have experimented with these combinations you will find that your speed will increase as more confidence

I would suggest you use clear topaz for its availability and price. A piece from which you can cut an 8mm diam. stone will be ideal.

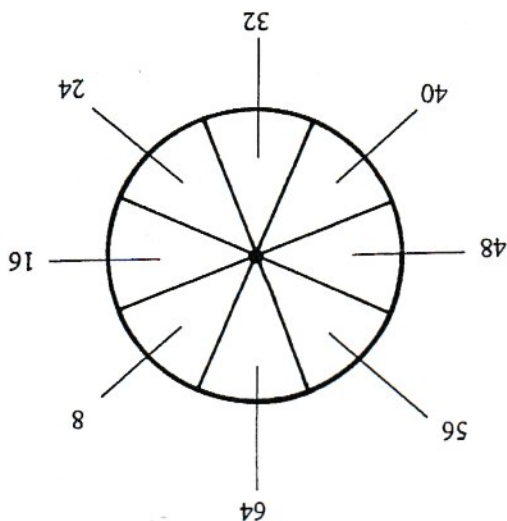
Our final diagram and stone will be the standard brilliant, we will cut it in topaz. This will allow you to use a different polishing medium and will also present a harder material for you to learn to facet.



Pavilion Girdle Facets



Pavilion Main Facets



advisable when grinding the rough that the table is oriented about 15 deg. from the cleavage plane.

As is normal the pavilion will be cut first after establishing the girdle of the stone. Having dropped the stone with wax set the dop in the machine with the handpiece in free-wheel and the cheater on zero (good housekeeping, remember?).

Set the 260 disc up the protractor at 90 deg. and the collet just close to the disc. Start the machine and lower the head so that the stone starts to cut. Keep rotating the handpiece against the direction of rotation of the disc. When you feel that you have the stone in a round condition, just set the index at 64 and take the machine out of free-wheel. What I want you to do now is cut 16 girdle facets indexing 64-4-8-12-16 etc. cutting so that the buzzer just sounds or the sound of cutting just disappears, **without any hand pressure**. Now, cut between those facets at 2-6-10-14-etc. Again just cut the noise away. Now put your handpiece in free-wheel and without adding ANY hand pressure link all those facets together, by doing this you will eliminate any possibility of the stone being 'out-of-round'. If you had attempted to cut a round stone you would, unconsciously have added pressure as you rotated the stone, added pressure then taken a new grip. By cutting 32 facets this problem can be eliminated. Later, with experience you will find that you can get by with 16 facets.

Set your protractor at 39 deg. index 64 and cut to a cullet point using 64-32-16-48-8-24-40-56 in that order. Just establish the cullet at the moment. Now set your protractor to 42 deg. and index 62-2; 6-10; 14-18; 22-26; 30-34; 38-42; 46-50; 54-58: this will establish your girdle facets and the shape of the pavilion. Set up the 1,200 disc, protractor at 90 and the handpiece in free-wheel. Slowly rotate the stone until you achieve a nice matt finish on the girdle. Reset the protractor to 42

so that the collet nut does not foul the stone just inside the rim of the lap is no need for the splash guard, and set You will have removed the gate, there and the handpiece in free-wheel. Swing your protractor to 89½ deg. by practise.

at the one time and this is only achieved entails bringing a lot of meets in cullet of all mains. Faceting stones maintained a needle junction at the the mains. Also make sure you have mains between the girdle facets and and also a meet part way down the the girdle line with the break facets mains. You must maintain a meet at girdle facets continue on with the When you are satisfied with the magnification.

so that scratches are not visible at this 10x to examine the stone and polish the loupe. If you wish just use your until you cannot see scratches with the facet. Adjust as previously outlined take five to ten seconds, then examine the lap. Only allow this operation to stone whilst slowly sweeping it across stone apply medium pressure to the protractor locking nut and holding the allow the stone to grab. Loosen the fine height adjustment down to just the machine running slow bring the to polish your girdle facets 42° with the tip of your finger. Set the protractor the lap rubbing it all over the lap with apply a few drops of Linde 'A' to Fit the tin lap to the machine and when you are ready to polish.

this good housekeeping, especially indicated before. I cannot overstress thoroughly clean the machine as Remove the 1,200 disc and perfect meet at the cullet point. 6-10 etc. you should also have a perfect meet at the junction of 62-2; at 64. Cut in the mains to ensure a your mains will be cut into. Set the the centre and at the junction where down until you have a perfect meet in on 6-10 etc. slowly bringing the stone to get a meet on the first pass. Continue and cut in the girdle facets do not try degrees index on 62-2 combination

To further your designs and the correct angles to cut them I would recommend that you join the Australian Facetors Guild and purchase the books they distribute in Australia on

To cut in girdle facets add between 4 and 6 degrees to the mains and for the star facets subtract 15 degrees. Thus for Topaz the Pavilion mains would be 39 and the girdle 43 to 45. The crown mains would be 42 the girdle facets would be 48 and the stars 27.

	Quartz	Topaz	Zircon	Corundum	Spinel
Crown mains	43	39	41	37	37
Pavilion mains	42	43	37	38	40

The principle reason for the publication of this booklet is to assist you following the purchase of your Gemmastia so that you can enjoy this pastime of faceting. I strongly recommend that for the first twenty to thirty stones that you cut you remain with quartz, topaz, zircon and synthetic corundum or synthetic spinel. I have tabulated below the pavilion and crown main angles to give you good brilliance.

TO SUMMARIZE

Now set up to facet the table as you have done previously, take particular care to stop scratches as you are dealing with a much harder material and the scratches are just that more difficult to eliminate. One of the best laps I have used for harder materials is the Zirconium Lap with 100,000 diamond spray or compound. This lap is excellent for topaz. When you have some experience and become interested in competition cutting or for normal cutting and polishing I strongly recommend that you give serious consideration to purchasing one of these laps. I use mine for 90% of my polishing, such is its versatility.

With a craft knife cut away any surplus compound it is only necessary to get below the girdle line at a slight angle, too much and you will weaken the holding capacity of the wax. Set your protractor to 48 deg. and index 62-2 and start cutting in your girdle facets continue on around on 6-10; 14-18; etc. as you did with the girdle facets on the pavilion. Next you cut in the mains at index 64 and protractor at 43° cut in the mains the same way you did with your first stone making sure that you get all your meets at the girdle line with the girdle 1/4mm thick. Your next row of facets will be 28 degrees and these are your star facets, again take care with the meets. When you have cut these in polish with your tin lap. The star facets will polish in quickly.

I want you to make up a brass pencil. Go to your local garage or engineering works and ask them for about three inches of 3/32" or 1/8" brazing rod. File a fine point on one end. Tilt the faceting head up and line up the point of the main where it touches the girdle, using your loupe put a mark on the girdle in line with that meet, do this to three mains, 56-64-8. You will use these marks later, when transferring is complete to line the pavilion mains up with the crown mains. Measure the height of the pavilion. Write it down. It will surprise you how often you can refer back later to these measurements to get the proportions of the rough to establish an idea of just how much you can get out of a piece of rough. Transfer the stone as previously described.

You did the pavilion. Polish the girdle to the same degree as away after, when doing the crown. In this case involves the height of the crown if you are going to cut this in this case involves the height of the blades) it does not make much sense for the width of the girdle (three razor to polish in just the amount necessary lap. The reason for the 89 1/2 allows you

behalf of Robert Long and Norman Steele. These books deal with a system of cutting referred to as 'Meet Point Facetting'. There are a number of books available dealing with Rounds, Ovals, Pears, Emeralds etc. A good start would be with either the Emeralds or the Ovals.

You will probably after a while settle down to a possible ten or twelve designs that you will become accustomed to and familiar with. This is not a bad attitude to take as many designs are variations of others. I would recommend that you purchase some synthetic material to practise on before committing a piece of expensive rough to an experimental design. Spinel is a little softer and easier to polish than corundum and the boulders, being whole to the corundums split, returns a bigger stone if you are that way inclined.

Generally speaking on smaller stones you use few facets and on larger stones (10 to 15mm) you use more facets to give greater brilliance. Darker stones have a shallower pavilion whereas lighter stones have deeper pavilions. Try to avoid if possible odd shaped designs they are very hard to get settings for unless you are prepared to have a setting specially made to suit the shape.

I hope you enjoy many years of faceting as so many in the fraternity have.

MAIN ANGLES

Gem Material	Critical Angle	Crown	Pavilion	Refractive Index	Hardness
Arculose	38	43	39	1.63	7-7.5
Adite	38	43	39	1.63	5
Beryl	39	42	43	1.57	7.5-8
Brazilianite	39	42	43	1.60	5.5
Chrysoberyl	35	37	42	1.74	8.5
Corundum	35	37	42	1.76	9
Diamond	24	35	41	2.41	10
Epidote	35	37	42	1.74	6-7
Feldspar	41	42	43	1.55	6-6.5
Fluorite	44	41	45	1.43	4
GARNETS					
Almandite	34	37	42	1.80	7.5
Andradite	32	37	42	1.89	6.5
Grossularite	35	37	42	1.73	7
Pyrope	35	37	42	1.74	7-7.5
Spessartite	34	37	42	1.80	6
Uvarovite	33	37	42	1.85	7.5
Opal	44	41	45	1.45	5.5
Peridot	37	43	39	1.67	6.5-7
Quartz	40	42	43	1.54	7
Spinel	36	37	42	1.71	8
Spodumne	37	43	39	1.66	6.7
Titania	23	34	41	2.900	6.5-7
Topaz	38	43	39	1.63	8
Tourmaline	38	43	39	1.63	7-7.5
Zircon (Crystal shape)	31	35	41	1.93	7.5
Zircon (Non-Crystal shape)	34	37	42	1.82	6.5-7